

Technical Specifications

Sound File Format	MP3 (ISO 11172-3 up to 44.1KHz)
Max. Number of Sound Files	Parallel / Direct Mode: 8 Parallel / Binary Mode: 128 Parallel / Sequential Mode: 8x99 Parallel / Round-Robin Mode: 8 Parallel / Script Mode: 999 Serial Control: 999
Memory Type	SD / SDHC
Max. Memory Capacity	2 GB (SD FAT/FAT16 formatted) 32GB (SDHC FAT32 formatted)
Max. Recording Time	33+ hrs (MP3 @ 128kbps w/2G card)
Supply Voltage	12 ~ 30 VDC
Standby Current	60 mA
Max. Audio Output	Stereo: 15W/channel (4 ohm load) Mono: 55W bridged load (BLT)
Serial Interface	RS-232 / RS-485
Parallel Interface	8 inputs, CMOS level logic
Physical Dimensions	Case 5.3'' x 4'' x 1.35''

Interface Descriptions

Power Input Terminals: V+ & GD

Use a well-regulated DC power supply to obtain the best sound quality. Connect the power supply's POSITIVE output to V+, and the GROUND output to terminal G. There is also a 2.1mm barrel connector on the side (center positive).

Speaker Output Terminals: L+ (left) & R+ (right)

The speaker outputs are single ended (unbalanced).

Busy Output Terminal: BY

This output is connected to the collector of a C2328A transistor and can be controlled through script mode. In other modes it is automatically turned on while playing audio, with a maximum sink current of 200 mA.

System Reset Terminal: RS

Short terminal RS to the ground to reset the board. Minimum reset duration is 100 ms.

Parallel Interface Terminals: T1 - T8 & GD

These inputs are internally pulled up to +5V through 10K resistors, and protected with 1K in-line resistors. These inputs are enabled by default but are disabled automatically if the serial port is enabled.

Power Light (PWR)

The power light is turned on when power is applied.

Volume Pot (VOL)

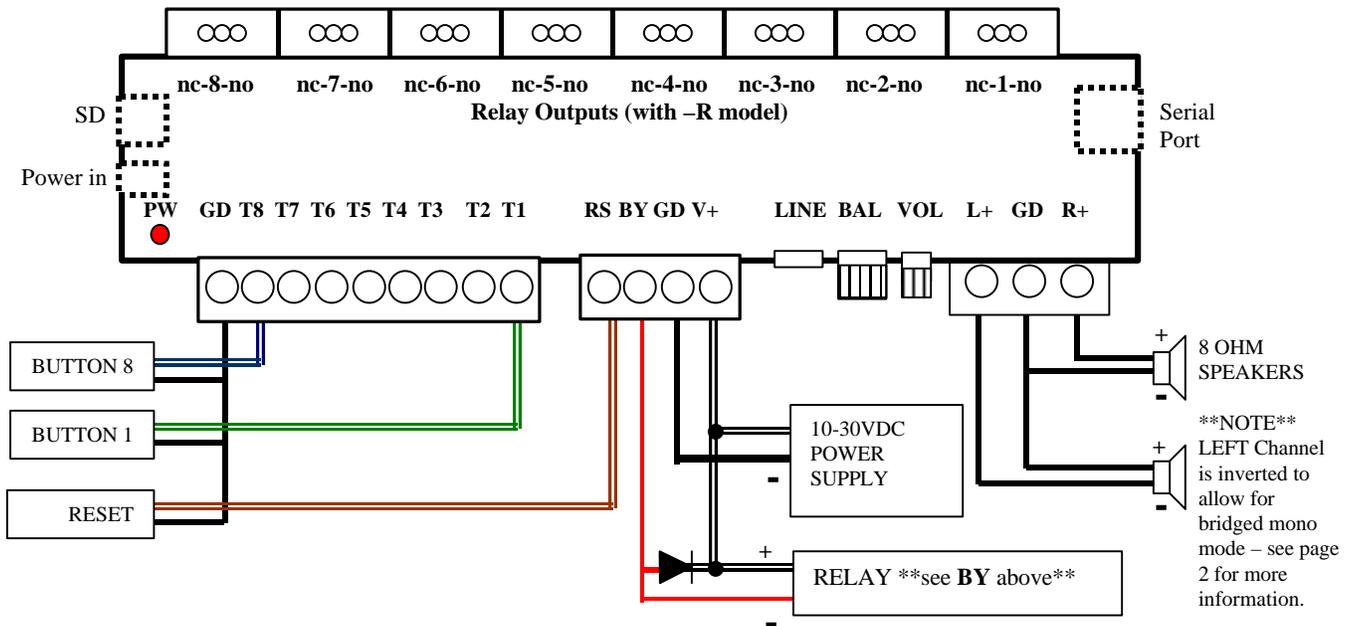
Turn the knob clockwise to increase the output volume. It affects both the speaker output and the line output.

Line Output (LINE): 1/8" Stereo Phone Jack

This jack provides single ended line output for external amplification (TIP-L, RING-R, SLEEVE-GROUND)

Serial Interface Connector: DB9 Female

The Serial Interface supports either RS-232 (default) or RS-485, but not both at the same time. To select RS-485, move the on-board jumper J2 to the "485" setting. Note that the Serial Interface is disabled by default, and it is mutually exclusive with the Parallel Interface.



Setup of the CompactFlash card.

The Compact Flash card should have nothing on it except for the MP3 files and the MODE.TXT file (no directories, other text files, hidden MAC files.... etc).

File Number Assignment

Sound files on the flash card must be assigned a unique file number for identification. The file number must always start with three digits ranging from 001~999 (max number of files is 511). Simply add the file number to the beginning of the original filename, for example: "WATER.MP3" is to be renamed "001WATER.MP3". To store the maximum number of files (511) make sure the filename is kept to 8.3 standard (8 ASCII uppercase characters):

Direct Trigger file numbers: 001~008
Binary Trigger file numbers: 001~128
Sequential and Serial control: 001~999 (511 files max)

The Configuration File (MODE.TXT)

By default, the system works in the following mode:
Parallel Control, Direct Trigger, Non-Interruptible Playback, Closed

To operate the system in other modes, you need to create an ASCII text file called "MODE.TXT". For serial control (RS-232/RS-485), the text file contains ONLY a two-digit address ranging from "01" to "32". In other modes (other than SCRIPT), it contains a 3 or 4-letter word on the first line:

First Letter: Trigger Mode

D = Direct
B = Binary
S = Sequential
R = Round Robin

Second Letter: Playback Mode

N = Non-interruptible
I = Interruptible
H = Holdable
S = Script

Third Letter: Trigger Polarity

C (or no letter) = Closed Contact (trigger only when contact closed)
O = Open Contact (trigger when contact open)
M = Make Contact (trigger once when closed)
B = Break Contact (trigger once when opened)

Fourth Letter: Left Channel Inversion (default).

(no letter) = enable (left channel is inverted)

R = regular audio (left channel is normal)

When enabled using a MONO file, this creates 4X more powerful differential output when a 8 ohm speaker is connected to the LEFT and RIGHT outputs from the TecMP3.

****NOTES****

For DS and BS modes, enter the Script starting from the second line. Be sure to add the word END at the end of the Script. **After editing the configuration file, be sure to save it as a "plain text file", "ASCII text file", or simply "text file". The system may not work if the configuration file is not created properly.**

Trigger Modes (4 modes)

The Trigger Mode defines how the playback is to be triggered via the Parallel Interface which has 8 inputs labelled T1 through T8. All inputs are internally connected to +5V through 10K resistors. If left unconnected, an input is at +5V (logic "1"). The Trigger Mode does not apply when the system is controlled via the Serial Interface.

Direct Trigger (most popular)

In this mode each input directly triggers a corresponding file: T1 = File 001, T2 = File 002, ... T8 = File 008.

A trigger is valid when the input is shorted to the ground for at least 50 ms. The Direct Trigger is prioritized from T1 (the highest) to T8 (the lowest). However, it does not mean a higher priority input can interrupt a lower one. It only means that if multiple triggers are applied at the same time, the highest priority wins.

Binary Trigger

Use the Binary Trigger to trigger up to 128 different files ranging from 001 to 128. The Binary Trigger is often preferred when the system is controlled by an external controller because it requires less I/O ports in most cases.

To trigger a particular file, the first step is to signal the file number on T1 (LSB) ~ T7 (MSB). The signal must be in the binary format with +5V being logic "1", and 0V (the ground) being logic "0". For example, to signal File 007 (binary code "0000111"), T1 ~ T3 should be at +5V, and T4 ~ T7 should be at 0V. Note that, as a special case, the binary code for File 128 is "0000000".

The second and the last step is to short T8 to the ground for at least 50 ms while maintaining the signal on T1 ~ T7. Afterwards, signals on T1 ~ T7 don't matter any more.

Sequential Trigger

Use the Sequential Trigger to sequentially trigger up to 99 different files per input (max 511 for FAT16), as defined below:

T1 triggers File 001 ~ 099

T2 triggers File 201 ~ 299

...

T8 triggers File 801 ~ 899

Each trigger on the same input activates a different file in the sequence. The sequence automatically restarts either when the end of the sequence is reached or when there is a break in the sequence.

For example, if there are three files for T1: 001, 002, and 004, the system will only sequence between 001 and 002. File 004 will never be played because File 003 is missing.

The Sequential Trigger is prioritized from T1 (the highest) to T8 (the lowest). However, it does not mean a higher priority input can interrupt a lower one. It only means that if multiple triggers are applied at the same time, the highest priority wins.

Round-Robin Trigger

This mode is very similar to the Direct Trigger mode except that the inputs are not prioritized. Therefore, if multiple inputs are tied to ground then their files will be played one after another, instead of just the highest priority one. Round-Robin mode can only be used in conjunction with Non-interruptible Playback and Script Playback.

Playback Modes (4 modes)

The Playback Mode defines how the playback is to proceed. The Playback Mode does not apply when the system is controlled via the Serial Interface.

Non-interruptible Playback

The file is played once per trigger. The playback is not interruptible except by the system reset. Looping is possible by applying a constant trigger on the input.

Interruptible Playback

The file is played once per trigger if not interrupted. Any other input (but not itself) can interrupt playback. Looping is possible by applying a constant trigger on the input.

Holdable Playback

The file is played for as long as the input is triggered, looping if necessary. It is not interruptible except by the system reset.

Script Playback

Instead of playing a single file, Script Playback executes a series of playback steps for each trigger. Written in the configuration file, the Playback Script consists of multiple lines each defining the steps for a particular trigger in the following format:

?nnnn=Step1, Step2...

Here “nnnn” is the trigger number and “?” is one of the following:

N - Non-interruptible

Execution of this trigger is not interruptible.

I - Interruptible

Execution of this trigger can be interrupted by any trigger other than itself.

H - Holdable

Execution of this trigger continues for as long as the trigger is present, repeating itself if necessary. The execution stops immediately when the trigger is no longer present.

In the DS and RS modes, there are 8 direct triggers (001 ~ 008, corresponding to T1 ~ T8).

In the BS (Binary script) mode, there are 128 direct triggers (001 ~ 128, corresponding to the binary code on T1 ~ T7).

In addition to the direct triggers, there are also indirect triggers. An indirect trigger can be activated only by jumping from another trigger using the Jump command.

In the DS and RS modes, there are 991 indirect triggers (009 ~ 999).

In the BS mode, there are 871 indirect triggers (129 ~ 999).

These are the script commands:

Fnnn - play File #nnn

Example: F068 plays file “068nnnn”.mp3

Wnnnnn - wait nnnnn units of 0.1 second

Example: W00020 waits 2 seconds.

Jnnn - jump to trigger #nnn

Example: J007 jumps to the line for trigger 007.

BF - turn off the Busy output

The Busy output is always turned off at the end of the script. Use this command to turn it off before the end of the script.

BN - turn on the Busy output

The Busy output is always turned on at the beginning of the script. Use this command to turn it on if it has been turned off previously by the BF command.

Rggn – RANDOM PLAY

Play a random file from group **g**, within the range of 01 to **nn**.

Basically “ggn” is the largest file# within the group that will play.

For example:

R104 will randomly play files between 101 and 104

R214 will randomly play files between 201 and 214

R324 will randomly play files between 301 and 324

Cont...

Relay Script Commands:

XNn - turn on relay #n

Example: XN8 turns on relay #8.

XNN - turn on all relays

Example: XNN turns on all relays.

XFn - turn off relay #n

Example: XF6 turns off relay #6.

XFF - turn off all relays

Example: XFF turns off all relays.

Xnnn – send binary value to relays

Example: X63 (binary 00111111) turns on relays 1~6.

END - Always add the word END at the end of the entire script. You may add any comments for your own reference after END.

Automatic Execution of Trigger 000

Upon power up or reset, the system will automatically execute trigger 000 once if it is defined in the script.

Script Sample

```
DS
N001=F007,BF,W00030,BN,F899,J168
I168=F001,W36000,J168
H033=F273
END
```

DS is not really a script command, but it tells the system to enter the Direct Script mode. You can also use RS or BS to enter the Round-Robin Script mode or the Binary Script mode.

When the T1 input is triggered, the system start executing trigger N001. Since this trigger is non-interruptible, it will always execute to the end. Trigger N001 is executed as the following:

- play file #007,
- turn off the Busy output,
- wait 3 seconds,
- turn on the Busy output,
- play file #899,
- jump to trigger 168 (I168).

Trigger I168 is executed as the following:

- play file #001,
- wait 60 minutes,
- jump back to itself.

Since trigger I168 is interruptible, this endless loop can be broken by any future trigger.

Trigger H033 will never be executed because it is an indirect trigger in the DS mode, yet it is not jumped to by any other trigger.

In the DS (Direct Script) mode, Script 001~008 are triggered via T1~T8 respectively, but other scripts can only be triggered via the J(ump) command. In the BS (Binary Script) mode, Script 001~128 are triggered with the Binary Trigger method, but other scripts can only be triggered via the J(ump) command.

Background Music Example

The automatic execution feature can be used to play background music while no trigger is being executed. For example,

```
DS
I000=F123,J000
N001=F001,J000
N002=F002,J000
N003=F003,J000
END
```

Here file #123 is loop played from power up but can be interrupted by trigger inputs T1, T2, and T3. After interruption, it always jumps to trigger 000 so file #123 starts to play again, although from the beginning instead of where it left off.

Serial Interface

When the serial interface is enabled, all parallel inputs are disabled and all parallel-related modes are no longer applicable. The serial interface consists of a female DB9 connector supporting either RS-232 or RS-485, but not both at the same time. The default selection is RS-232. To use RS-485, you must move the on-board jumper J2 to the “485” setting.

On the DB9 connector, three pins are used for RS-232: pin 2 for RX (output), pin 3 for TX (input), and pin 5 for ground. Two pins on the same connector are used for RS-485: pin 1 for negative, pin 9 for positive. The communications protocol is 9600-baud, eight data bits, no parity and one stop bit (9600, 8,N,1).

For RS-232 applications, the TecMP3 is connected to a DTE device (such as a PC) with a regular serial cable (not a null modem cable). For RS-485 applications, up to 32 systems, each assigned with a unique address, can be daisy chained on the same bus with a 2-wire cable.

To enable the serial interface on the system, the configuration file (**MODE.TXT**) must contain a two-digit address ranging from “00” to “32”. This address assignment seems unnecessary for RS-232 applications because RS-232 is a one-to-one interface. However, it is necessary for us because we want to provide a uniform protocol for both RS-232 and RS-485. **Use ID “00” if individual addressing is not required.**

The benefit of a uniform protocol is that it allows us to control multiple systems from a DTE, which has only a RS-232 port. In this case a RS-232 to RS-485 hardware converter is needed to convert the DTE’s RS-232 port into a RS-485 port. The communication protocol uses software handshake on a per-byte basis. That is, for every byte it receives, the system sends a confirmation byte to the DTE. The DTE must not send the next byte until it receives the confirmation (one exception explained below). A communication session always starts with a selection process.

For IDs other than ‘00’:

If using an address other than “00” the DTE should first sends out an ASCII “A” which, as the only exception, will not be confirmed by any system on the bus. The DTE should then sends a binary coded address byte ranging from 1 to 32. If there is a system with the matching address, it will respond by sending back an ASCII “a” within 100 ms. Otherwise the selection process has failed and the unit should be restarted.

Serial Commands

Play File

DTE Sends: F### (### is the three-digit file number)

System Confirms: f### (### is the same file number as above)

If the file exists, it will be played once. If the file does not exist, the command will simply be ignored. If a file is already playing or pausing when receiving the “F” command, it will return the error code “e” instead of “f”. Use the Stop Playback command to ensure the player is stopped.

Loop File

DTE Sends: L### (### is the three-digit file number)

System Confirms: l### (### is the same file number as above)

If the file exists, it will be played repeatedly. If the file does not exist, the command will simply be ignored. If the system is playing or pausing when receiving the “L” command, it will return the error code “e” instead of “l” (lower case L).

Stop Playback

DTE Sends: S

System Confirms: s

If the system is not playing/paused at the time, it will simply ignore the command. Otherwise it will terminate the playback.

Pause Playback

DTE Sends: P

System Confirms: p

If the system is not playing at the time, it will simply ignore the command.

Resume Playback

DTE Sends: R

System Confirms: r

If the system is not pausing at the time, it will simply ignore the command.

Busy?

DTE Sends: B

System Confirms: b (if playing/paused) or s (if not busy).

Query Parallel Port

DTE Sends: Q

System Confirms with a single 8-bit byte representing the 8 triggers (1= HIGH/open and 0=LOW/grounded). MSB is T8 and LSB is T1.

Script Command

DTE Sends: C###C (### is one line of script commands)

System Confirms c###c – echo of above

System executes the script line (i.e. CF001W00020F002C).

Relay On (-R version)

DTE Sends: XN# (# is the relay number)

System Confirms: xn# (# is the same relay number as above)

For example, “XN5” turns on relay #5. To turn on all relays, use “XNN”. This command can be issued at any time.

Relay Off (-R version)

DTE Sends: XF# (# is the relay number)

System Confirms: xf# (# is the same relay number as above)

For example, “XF8” turns off relay #8. To turn off all relays, use “XFF”. This command can be issued at any time.

Send Binary to Relay (-R version)

DTE Sends: Xnnn (nnn is a three digit number with leading zeros)

System Confirms: nnn (nnn is the number as above)

For example, “X005” turns on relay #1 and #3. – rest off

Query Relay Status (-R version)

DTE Sends: Y

System Confirms: nnn (nnn is the decimal number equal to the binary value)

For example, “005” = relay #1 and #3 on – rest off

Set Volume

DTE Sends: Vllrr (ll is the LEFT volume#, rr is the RIGHT volume#)

System Confirms: vllrr (ll and rr are the same volume numbers as above)

Volume numbers range from 00 (silence) to 64 (loudest – the volume level set by the volume knob on the player). For example, 32 would be the half the level of the current volume level.

Get Volume

DTE Sends: W

System Confirms: llrr (ll and rr are the current LEFT and RIGHT volume#)

Serial Command Error Code

The system will confirm with an “e” if an invalid command is received, or if a valid command is received at the wrong time. **After receiving the error code, the DTE device should restart the session from the beginning (the selection process).**

Relay Output (with optional –RO relay module)

The TecMP3-R comes with eight relay outputs. The single pole, double throw contact of each relay is rated at 12A/120VAC or 10A/24VDC. These relays are controlled differently in different modes:

In Serial Interface Mode

Relays are controlled by serial commands. Please see the Serial Commands section for a full description.

In Script Modes: DS, BS and RS

Relays are controlled by script commands. Please see the Script Playback Mode section for descriptions.

All other Modes

A relay will turn on when the corresponding file is being played. For example, relay #1 will turn on when file #001 is being played, relay #2 will turn on when file #002 is being played, and so on. This operation is automatic and there is no need to add any text in the configuration file.

Troubleshooting

TecMP3 is not responding

Power LED is not ON

Make sure the power supply is connected properly and to the proper connectors (+ and -).

Power LED is ON but player is not responding

- Make sure the card is formatted to FAT16 and that there are no hidden files or directories on the card.
- Make sure you have the MODE.TXT file properly configured. If in doubt, make the unit DIRECT INTERRUPTIBLE (DI) and manually start the songs before attempting RS232 or more sophisticated controls.

Parallel Interface Related

Plays no sound at all.

- File numbers are not assigned properly.
- The system is in the wrong mode due to missing or incorrect configuration file.
- If the flash card is inserted when the power is on, the system may not work. To fix this problem, turn the power off for a few seconds to reset the system.
- Some CF cards, especially if they have been used in digital cameras, need to be reformatted with the FAT16 file system.
- The output volume may have been set too low. Try turning up the volume.

Plays a wrong File.

- File numbers are not assigned properly.
- The system is in the wrong mode due to missing or incorrect configuration file.

Serial Interface Related

The DTE device receives strange characters.

- Make sure the DTE device's serial port setting is 9600 baud, 8 data bits, no parity, 1 stop bit.

RS-232 does not normally support multiple unit addressing. Does the DTE device still need to send the address byte after sending the initial letter "A"?

- Yes (**unless using ID 00 on the TecMP3**), because the protocol is designed to be uniform for both RS-232 and RS-485.

Typical RS232 session to play file12 on player ID 01

DTE sends two bytes	A[01]
TecMP3 responds with	a
DTE sends	F
TecMP3 responds with	f
DTE sends	0
TecMP3 responds with	0
DTE sends	1
TecMP3 responds with	1
DTE sends	2
TecMP3 responds with	2

(TecMP3 starts playing file 12).
In this example [01] is decimal 1.

Typical RS232 session to play file23 on player ID 00

DTE sends	F
TecMP3 responds with	f
DTE sends	0
TecMP3 responds with	0
DTE sends	2
TecMP3 responds with	2
DTE sends	3
TecMP3 responds with	3

(TecMP3 starts playing file 23).

APPLICATION EXAMPLES

- Using Normally Open Push Buttons

1. Play without interruption.

Intended Operation

- Press button #1 to play file #001 once.
- Press button #2 to play file #002 once.
- When playing, pressing any button has no effect.

Required Text in MODE.TXT

None, this is the default mode (DN).

Notes

- The button can be released or held down when playing.
- If the button is held down at the end of the sound, the sound will be played again.
- If both buttons are pressed or held down at the same time, button#1 prevails.

2. Allow interruption during playback.

Intended Operation

- Press button #1 to play file #001 once.
- Press button #2 to play file #002 once.
- Playing can be interrupted by pressing any other button.

Required Text in MODE.TXT

DI

Notes

- When playing, pressing the same button again has no effect.

3. Play the sound only once even if the button is held down.

Intended Operation

- Press button #1 to play file #001.
- Press button #2 to play file #002.
- Don't repeat the sound even if the button is held down.

Required Text in MODE.TXT

DS

N001=F001,J888

N002=F002,J888

H888=J888

END

Notes

- The system will stay in the "H888=J888" endless loop for as long as the button is held down.

4. Play only when the button is held down.

Intended Operation

- Press & hold button #1 to play file #001.
- Press & hold button #2 to play file #002.
- Repeat the sound for as long as the button is held down.

Required Text in MODE.TXT

DH

Notes

- Playing stops as soon as the button is released. If the same button is pressed again later, playing re-starts from the beginning of the file instead of where it left off.
- If both buttons are held down, button #1 prevails. To play both sounds alternately when both buttons are held down, use the RH mode.

5. Play different sounds each time when the same button is pressed.

Intended Operation

- Press button #1 to play file #001 the first time, file #002 the second time, and etc.
- Button #2 sequences through file #201, #202...
- When playing, pressing any button has no effect.

Required Text in MODE.TXT

SN

Notes

- To allow playback interruption, use the "SIM" mode.
- To play only when the button is held down, use the SH mode.
- Up to 99 files can be assigned to each button and file numbers must be consecutive.
- In the SH mode, the same sound will repeat for as long as the button is held down. To advance to the next sound, the button must be released first.

6. TECMP3-R: Turn on a different relay for each sound.

Intended Operation

- Turn on relay #1 when playing file #001.
- Turn on relay #2 when playing file #002.

Required Text in MODE.TXT

Only the mode letters are required, for example: DH.

7. TecMP3 turns on multiple relays for each sound.

Intended Operation

- Press button #1 to play file #007 and turn on relays #1 & 2.
- Press button #2 to play file #008 and turn on relays #2 & 3.

Required Text in MODE.TXT

DS

N001=XN1,XN2,F007,XFF

N002=XN2,XN3,F008,XFF

END

Notes

- XFF is used to turn off all relays.

8. TECMP3-X: Control relays during audio playback.

The relays will be controlled automatically when playing QWA files. There is no required text in MODE.TXT.

APPLICATION EXAMPLES

- Automatic Playback on Power-up

1. Repeat continuously on power-up.

Intended Operation

- Play file #001 on power-up if switch #1 is turned on.
- Play file #002 on power-up if switch #2 is turned on.
-
- Play file #008 on power-up if switch #8 is turned on.
- If more than one switch is turned on, play all corresponding files sequentially
- Repeat the file(s) until power is turned off.

Required Text in MODE.TXT

RN

Notes

- A direct short can be used if there is only one sound file.
- If priority is required, use DN instead of RN. In this case switch #1 has the highest priority, switch #2 has the second highest priority, and switch #8 has the lowest priority.
- If more than one switch is turned on, only the file for the switch of the highest priority will be played.

2. Repeat at intervals on power-up.

Intended Operation

- Same as the example above but play files at intervals.

Required Text in MODE.TXT

RS

N001=F001,W06000

N002=F002,W06000

.....

N008=F008,W06000

END

Notes

- W06000 is a delay loop of 6000 x 0.1 second = 10 minutes, so the file(s) will be played at an interval of 10 minutes, one file at a time.

APPLICATION EXAMPLES

-Using Normally Closed Switches & Sensors

Normally closed switches and sensors are often used in security systems.

1. Play when the switch/sensor opens, with no priorities.

Intended Operation

- Play file #001 when sensor #1 opens.
- Play file #002 when sensor #2 opens.
- Repeat the sound for as long as the sensor is open.
- If multiple sensors are open at the same time, play all corresponding files sequentially.

Required Text in MODE.TXT

RNO

Notes

- Unused inputs must be connected to the ground, as shown in the wiring diagram.

2. Play when the switch/sensor opens, with priorities.

Intended Operation

- Same as the example above, but if multiple sensors are open at the same time, the sensor of the highest priority prevails.

Required Text in MODE.TXT

DNO

Notes

- The sensor connected to T1 has the highest priority, and the sensor connected to T8 has the lowest priority.

3. Play when the switch/sensor opens, but don't repeat.

Intended Operation

- Play file #001 when sensor #1 opens.
- Play file #002 when sensor #2 opens.
- Do not repeat the sound.

Required Text in MODE.TXT

DSO

N001=F001,J999

N002=F002,J999

H999=J999

END

Notes

- The system will stay in the "H999=J999" endless loop for as long as the sensor is open. The system will not respond to other sensors until this one is closed.